RFLA1018S

Variable Gain, Low Noise, High Linearity Amplifier 1920MHz to 1980MHz

Package: MCM, 16-pin,
8.0mm x 8.0mm

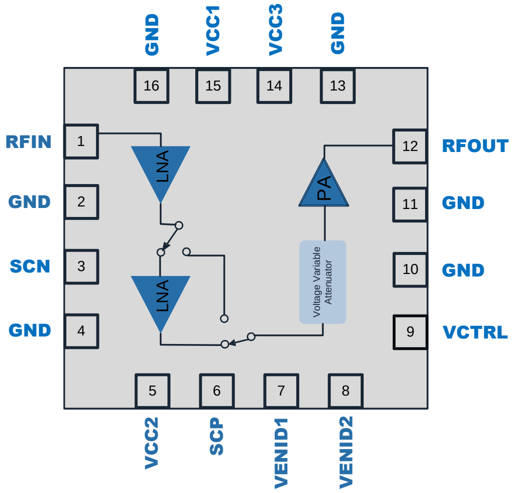
The RFLA1018S is an analog controlled voltage variable gain amplifier featuring high linearity and very low noise figure. This LNA with bypass mode and variable attenuator provides a minimum of 35dB of dynamic range. The RFLA1018S has a 3.3V control range with maximum gain at 0V. The LNA is temperature compensated to reduce gain variation. Noise figure of 0.8dB and IIP3 of 2dBm make this component ideal for receiver input line-ups. The RFLA1018S is packaged in a small 8.0mm x 8.0mm leadless MCM that is internally matched to 50Ω on all RF ports.

Features

- 1920MHz to 1980MHz Operation
- Internally Matched to 50Ω on All RF Ports
- Analog Voltage Variable Attenuator with 3.3V Control Range
- Bypass mode of LNA for High Dynamic Range
- Max Gain = 35dB Minimum
- Noise Figure of 0.8dB Typical
- Gain Control Range >35dB
- High IIP3 = 2dBm
- Single +5V Supply

Applications

- Cellular Base Stations, Remote Radio Heads
- Active Antenna Radios
- 3G, LTE Infrastructure
- Low Noise, Variable Gain with High Linearity



Functional Block Diagram

Ordering Information

RFLA1018SSQ	Sample bag with 25 pieces
RFLA1018SSR	7" Reel with 100 pieces
RFLA1018STR13	13" Reel with 2500 pieces
RFLA1018SPCK-410	1920MHz to 1980MHz PCBA with 5-piece sample bag

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Absolute Maximum Ratings

Parameter	Rating	Unit
Control Voltage	+5.5	V
Supply Voltage	+5.5	V
DC Supply Current	400	mA
Power Dissipation	2000	mW
Max RF Input Power	27	dBm
Operating Temperature	-40 to +85	°C
Storage Temperature Range	-40 to +150	°C
Maximum Junction Temperature	+160	°C
ESD Rating - Human Body Model (HBM)	1000 (Class 1C)	V
Moisture Sensitivity Level	MSL3	

Caution! ESD sensitive device.

RoHS (Restriction of Hazardous Substances): Compliant per EU Directive 2011/65/EU.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

Nominal Operating Parameters

Parameter	Specification			Unit	Condition
	Min	Typ	Max		
General Performance					**Electrical Specifications, TA = -40°C to 85°C, V_{CC} = 4.75V to 5.25V, High Gain Mode, Standard Applications Circuit**
Operating Frequency Range	1920		1980	MHz	
Max Gain	35	38		dB	Attenuation = Minimum, V_{CTRL} = 0V
	36	37.5		dB	Attenuation = Minimum, V_{CTRL} = 0V, Temp = 25°C
Gain Flatness		0.7	1	dB	
Gain Range	13.7		35.9	dB	All Conditions
Output IP3		37		dBm	Max Gain, Attenuation = Minimum, V_{CTRL} = 0V
Input IP3	0	2		dBm	30dB to 35dB Gain
	1.5	9		dBm	29dB Gain
	3	9		dBm	19dB to 28dB Gain
Output P1dB (Max Gain)		25		dBm	Attenuation = Minimum, V_{CTRL} = 0V
Input P1dB	-14	-6		dBm	30dB to 35dB Gain; Minimum Input P1dB specifications can be relaxed 1dB between -10°C to -40°C
	-10	-3		dBm	29dB Gain; Minimum Input P1dB specifications can be relaxed 1dB between -10°C to -40°C
	-7	0		dBm	19dB to 28dB Gain; Minimum Input P1dB specifications can be relaxed 1dB between -10°C to -40°C
Noise Figure		0.8	1.25	dB	35dB Gain
Input Return Loss		-23	-20	dB	25dB to 35dB Gain; Maximum Return Loss specifications can be relaxed 2dB between -10°C to -40°C
		-24	-18	dB	19dB to 24dB Gain; Maximum Return Loss specifications can be relaxed 2dB between -10°C to -40°C

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Parameter	Specification			Unit	Condition
	Min	Typ	Max		
General Performance - Continued					**Electrical Specifications, TA = -40°C to 85°C, V_{CC} = 4.75V to 5.25V, High Gain Mode, Standard Applications Circuit**
Reverse Isolation	60	76		dB	35dB Gain
Output Return Loss		-22	-15	dB	19dB to 35dB Gain; Maximum Return Loss specifications can be relaxed 2dB between -10°C to -40°C
S11 Phase Variation		25	100	Deg	1950MHz when input return loss is between 20dB to 25dB over temperature range from 25° to 85°C
General Performance					**Electrical Specifications, TA = -40°C to 85°C, V_{CC} = 4.75V to 5.25V, Low Gain Mode, Standard Applications Circuit**
Operating Frequency	1920		1980	MHz	
Max Gain	20	22		dB	Attenuation = Minimum, V_{CTRL} = 0V
Gain Flatness		0.4	1	dB	
Gain Range	-2.7		20	dB	All Conditions
Output IP3		37		dBm	Max Gain, Attenuation = Minimum, V_{CTRL} = 0V
Input IP3	14	20		dBm	12dB to 18dB Gain
	18	22		dBm	3dB to 11dB Gain
Output P1dB (Max Gain)		25		dBm	Attenuation = Minimum, V_{CTRL} = 0V
Input P1dB	4	10		dBm	12dB to 18dB Gain; Minimum Input P1dB specifications can be relaxed 1dB between -10°C to -40°C
	7	12		dBm	3dB to 11dB Gain; Minimum Input P1dB specifications can be relaxed 1dB between -10°C to -40°C
Noise Figure		3.8	11.3	dB	18dB Gain
Input Return Loss		-22	-18	dB	3dB to 18dB Gain; Maximum return loss specification can be relaxed 2dB between -10°C and -40°C
Output Return Loss		-22	-15	dB	
S11 Phase Variation		25	100	Deg	1950MHz when input return loss is between 20dB to 25dB over temperature range from 25° to 85°C
Power Supply					**Electrical Specifications, TA = -40°C to 85°C, V_{CC} = 4.75V to 5.25V, Standard Application Circuit**
Supply Voltage	4.75	5	5.25	V	
V_{CTRL} Voltage	0		3.3	V	
Logic High	2		5	V	
Logic Low	0		1	V	
Thermal Resistance		35.5		°C/W	85°C at 5V; T_{REF} = Backside of Module

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Parameter	Specification			Unit	Condition
	Min	Typ	Max		
Current					**Electrical Specifications, TA = -40°C to 85°C, V_{CC} = 4.75V to 5.25V, Low Gain Mode, Standard Application Circuit**
Supply Current	250	290	320	mA	HG Mode
Current [1]	250	290	320	mA	
Current [2]	160	200	225	mA	LG Mode

Notes:

1. LG Mode with 2nd LNA bypass VCC still applied
2. LG Mode with 2nd LNA bypass VCC disabled

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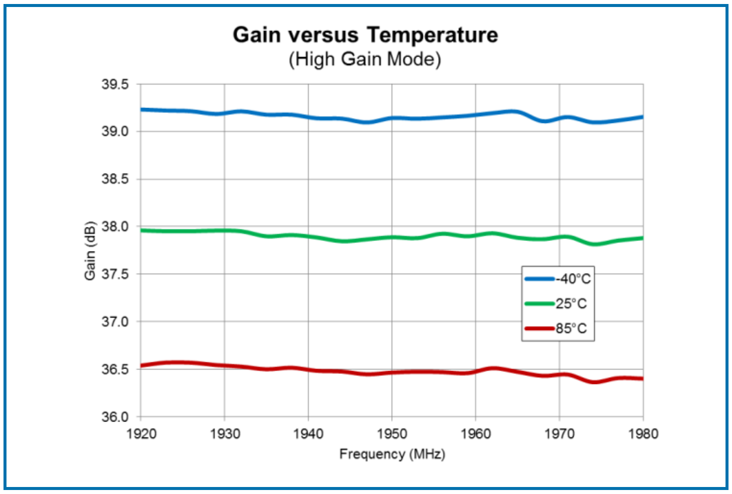
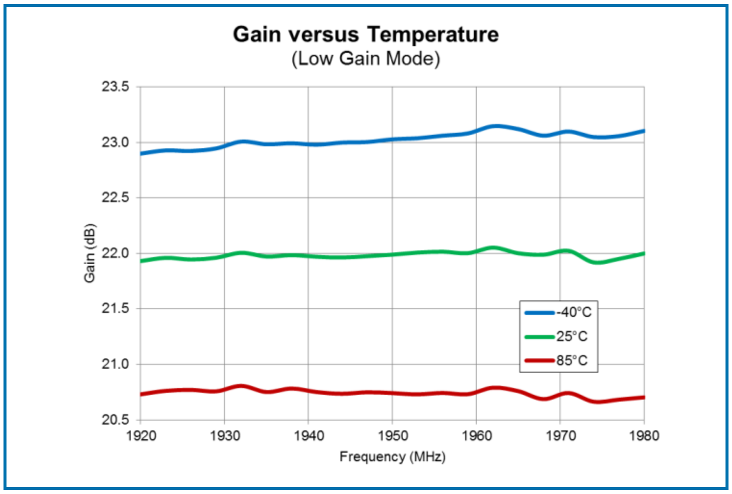
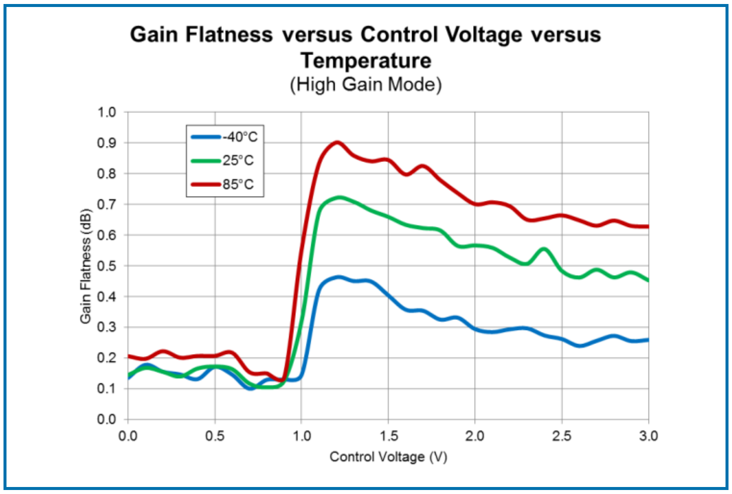
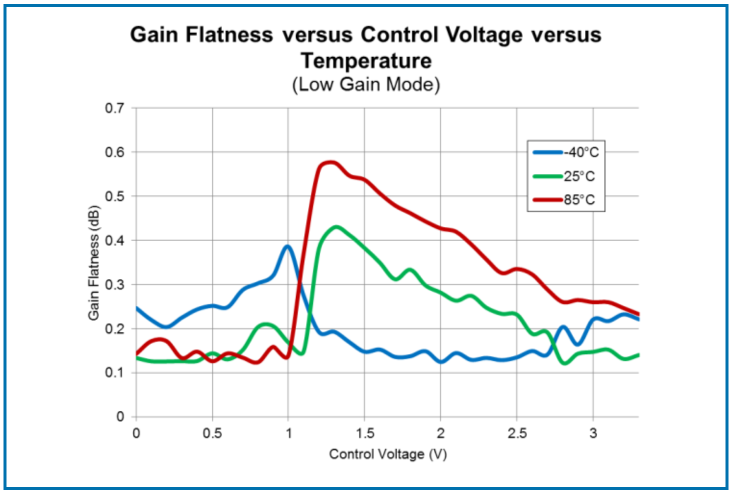
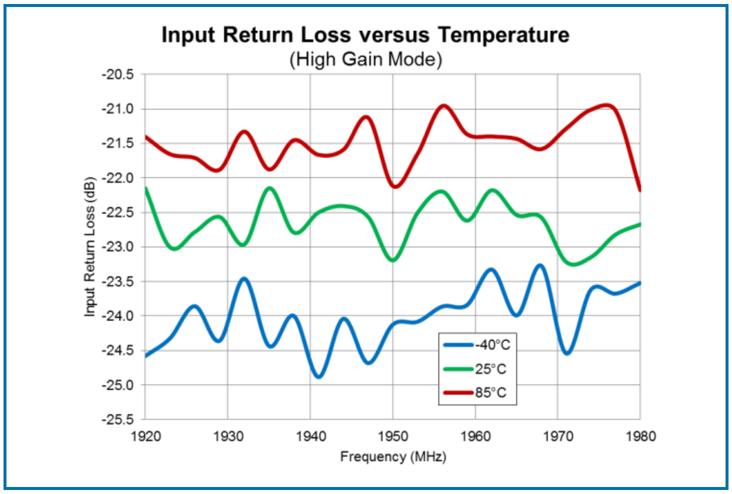
Typical Performance: T = 25°C, V_{DD} = 5V unless otherwise noted

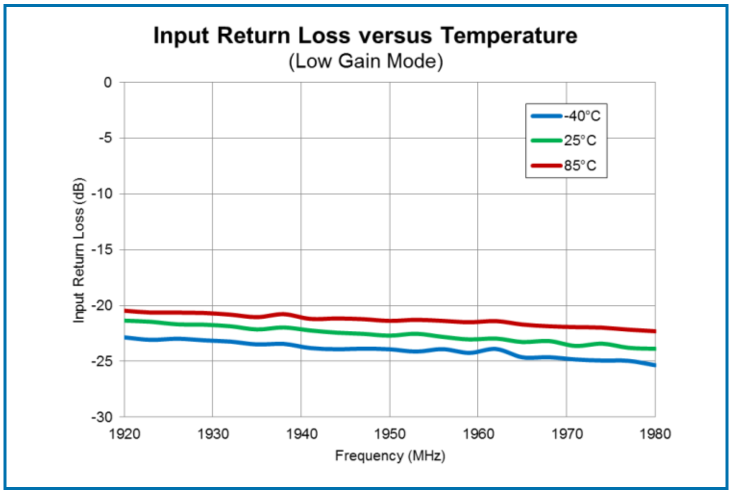

Gain versus Temperature
(High Gain Mode)


Gain versus Temperature
(Low Gain Mode)


Gain Flatness versus Control Voltage versus Temperature
(High Gain Mode)


Gain Flatness versus Control Voltage versus Temperature
(Low Gain Mode)


Input Return Loss versus Temperature
(High Gain Mode)


Input Return Loss versus Temperature
(Low Gain Mode)

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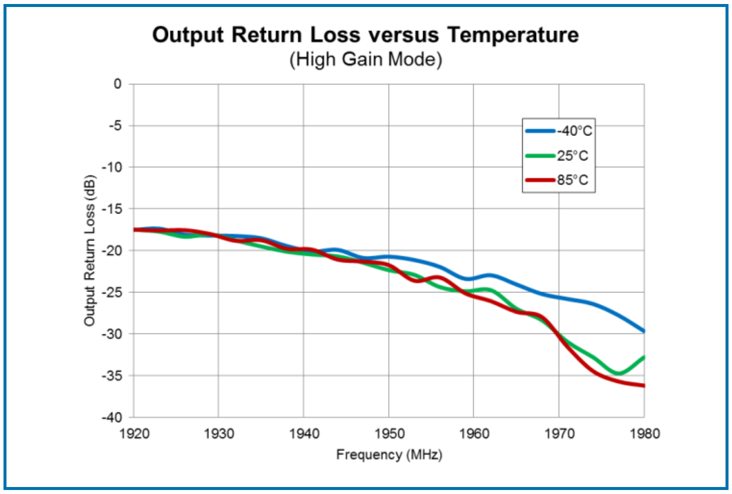
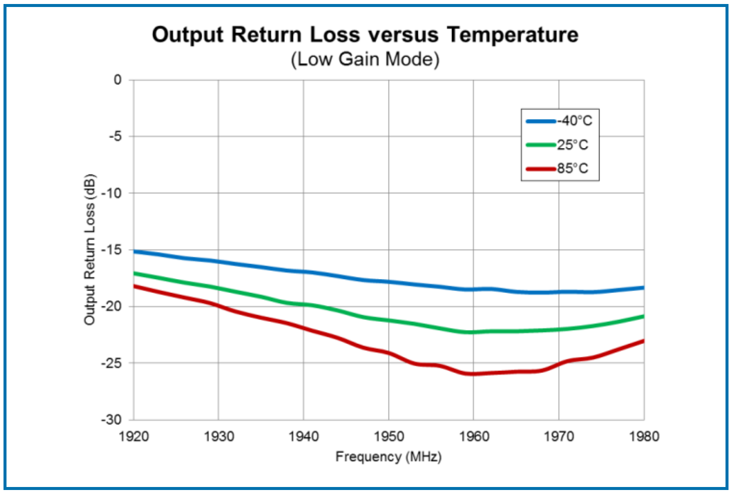
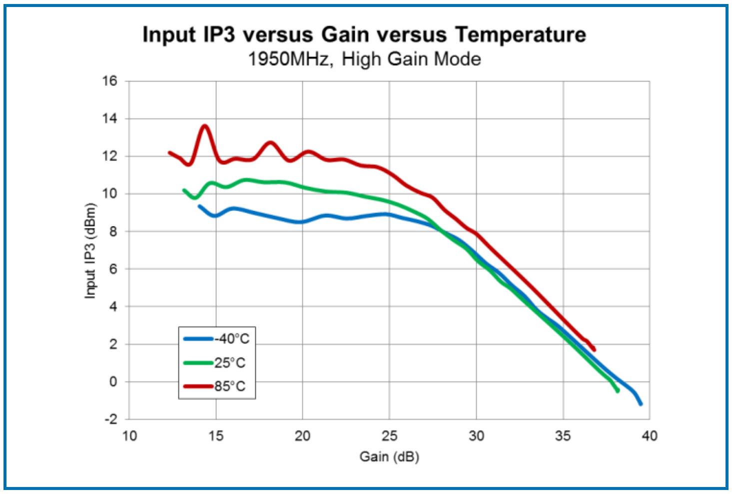
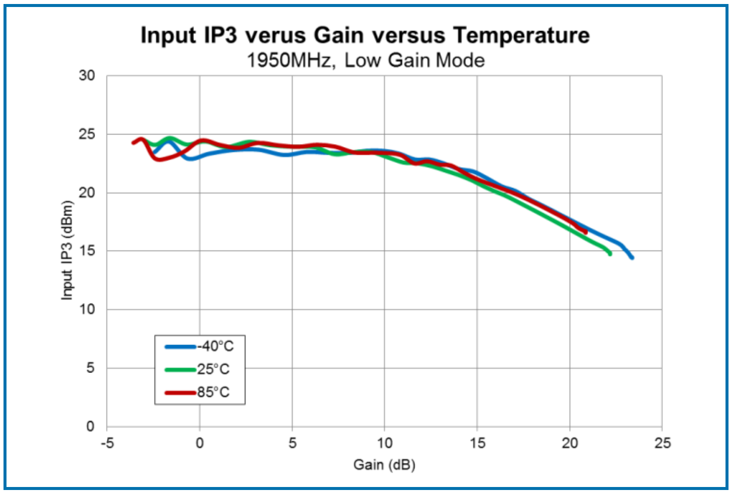
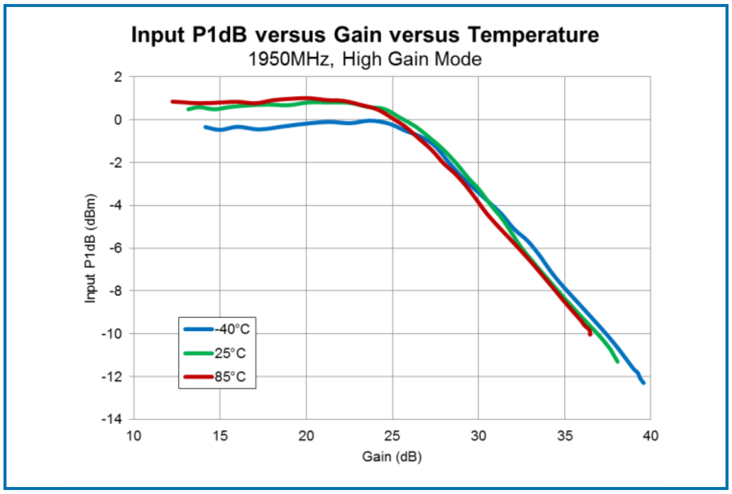
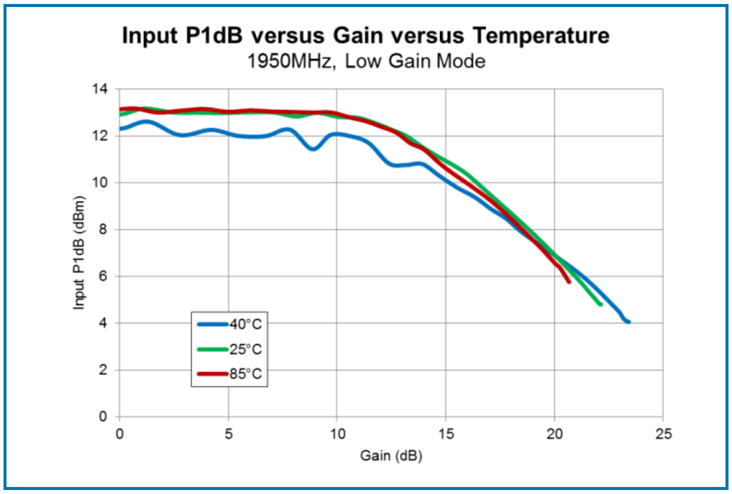

Output Return Loss versus Temperature
(High Gain Mode)


Output Return Loss versus Temperature
(Low Gain Mode)


Input IP3 versus Gain versus Temperature
1950MHz, High Gain Mode


Input IP3 verus Gain versus Temperature
1950MHz, Low Gain Mode


Input P1dB versus Gain versus Temperature
1950MHz, High Gain Mode


Input P1dB versus Gain versus Temperature
1950MHz, Low Gain Mode

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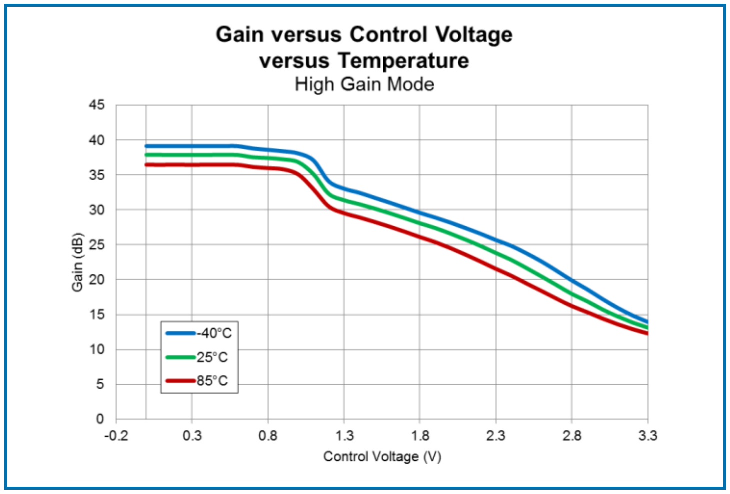

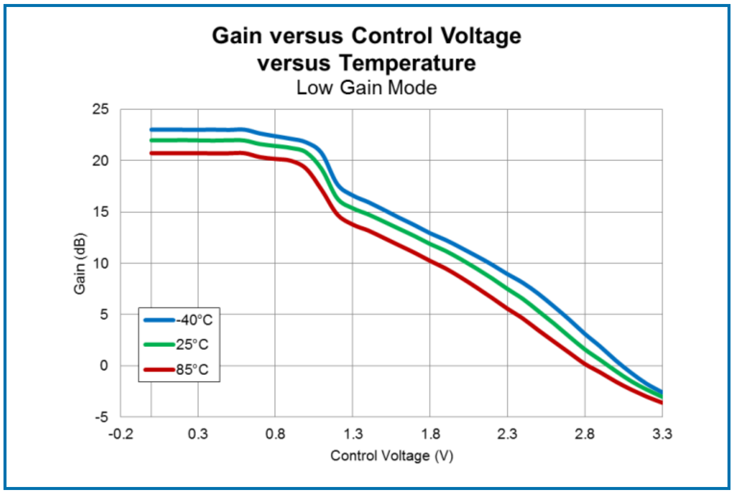

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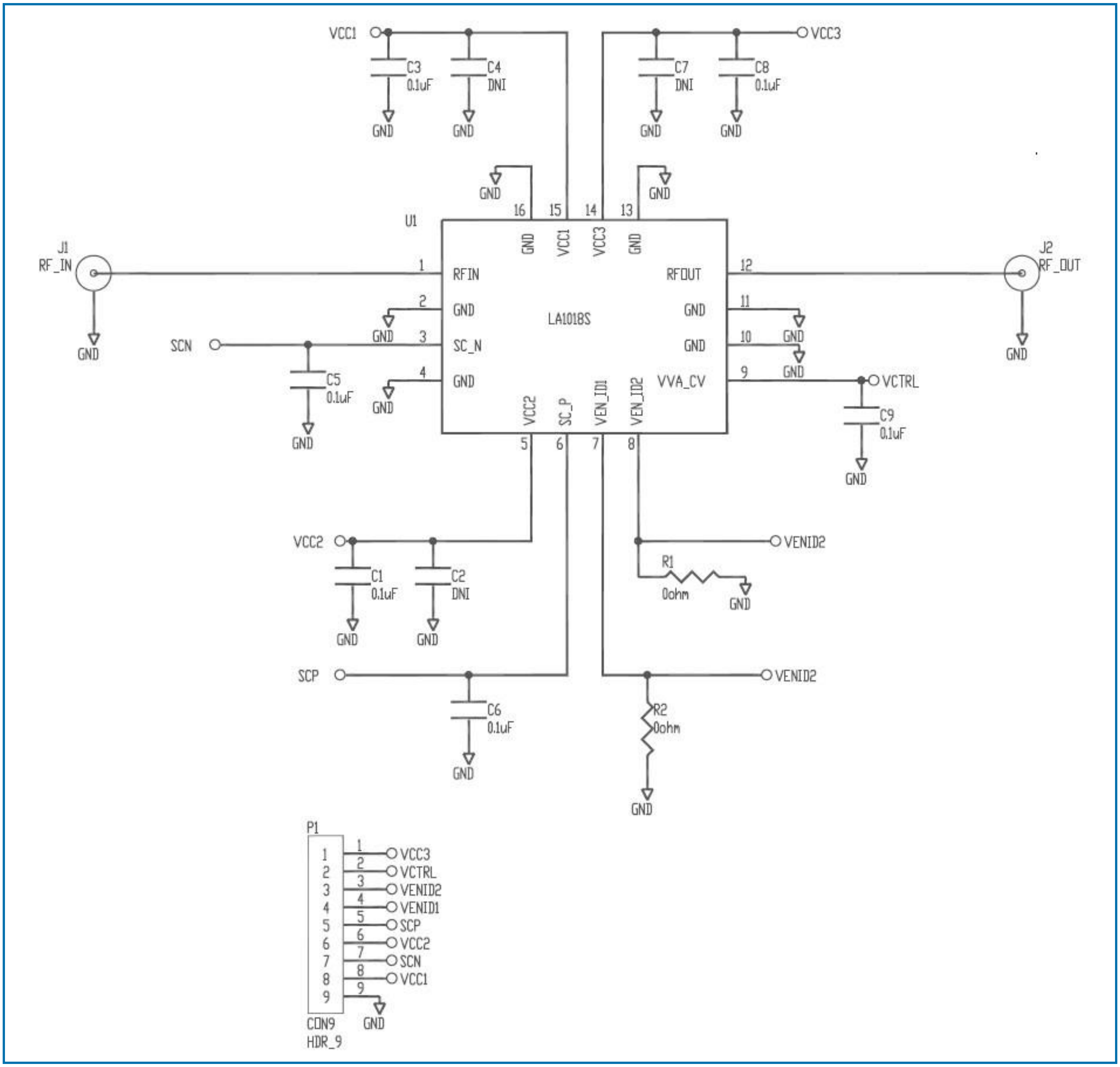
Evaluation Board Schematic 1920MHz to 1980MHz Application Circuit



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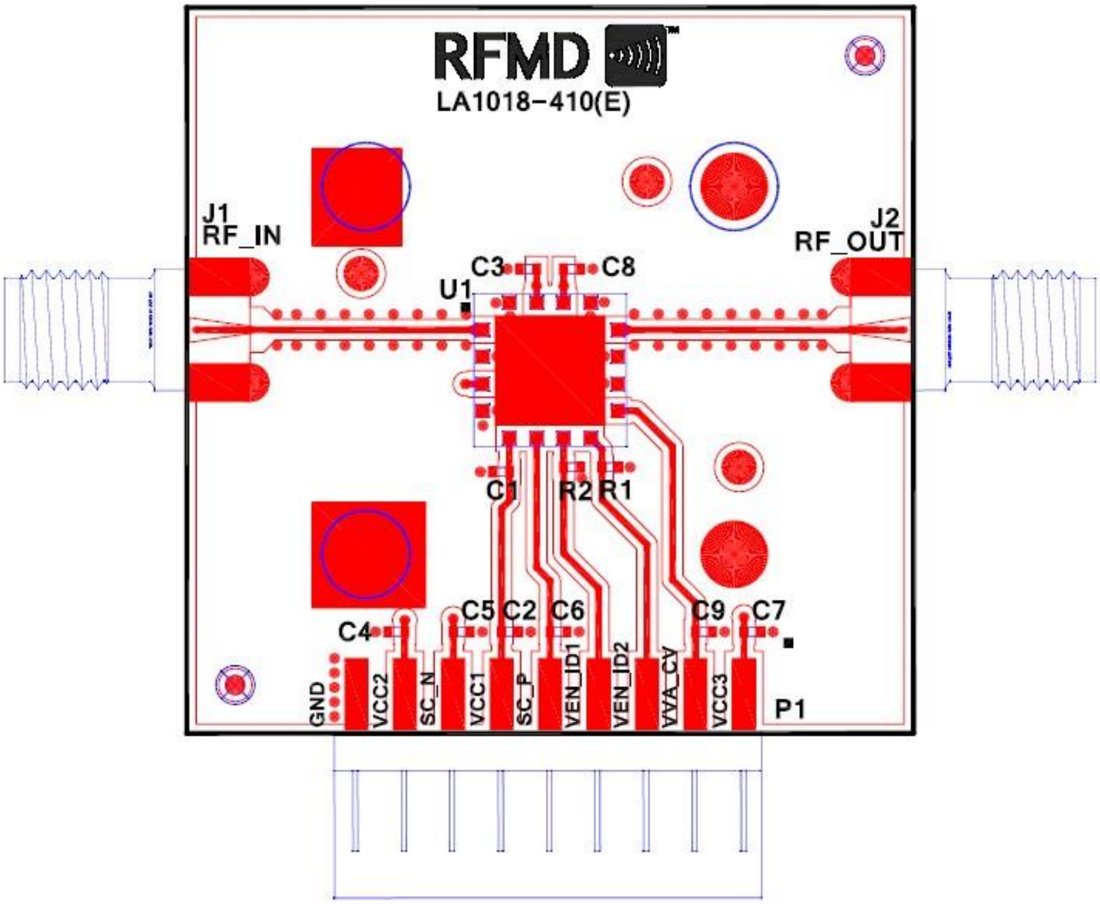
Evaluation Board Bill of Materials (BOM) 1920MHz to 1980MHz Application Circuit

Description	Reference Designator	Manufacturer	Manufacturer's P/N
Evaluation Board		DDI	RFLA1018410(E)
CAP, 0.1µF, 10%, 16V, X7R, 0402	C1, C3, C5-C6, C8-C9	Murata Electronics	GRM155R71C104KA88D
Do Not Place	C2, C4, C7		
CONN, SMA, END LNCH, UNIV, HYB MNT, FLT	J1-J2	Heilind Electronics	PER MAT-21-1038
RES, 0Ω, 0402	R1-R2	Kamaya, Inc.	RMC1/16SJPTH
CONN, HDR, ST, PLRZD, 9-PIN	P1	ITW Pancon	MPSS100-9-C
RFLA1018S Module	U1	RFMD	RFLA1018S

Evaluation Board Assembly Drawing 1920MHz to 1980MHz Application Circuit



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Pin Names and Descriptions

Pin	Name	Description
1	RFIN	RF Input; internally 50Ω matched and DC blocked
2	GND	Connect to low inductive path to ground
3	SCN	Switch Control Line; See truth table
4	GND	Connect to low inductive path to ground
5	VCC2	VCC Supplied; 0.1µF decoupled internal, supply voltage to 2nd stage LNA; Disable VCC supply in bypass mode to save DC current
6	SCP	Switch Control Line; See truth table
7	VENID1	Pin grounded in module
8	VENID2	Pin grounded in module
9	VTRL	Voltage Variable Attenuator Control Line; Max gain 0V
10	GND	Connect to low inductive path to ground
11	GND	Connect to low inductive path to ground
12	RFOUT	RF Output; internally 50Ω match; External DC block required
13	GND	Connect to low inductive path to ground
14	VCC3	VCC Supply; 0.1µF decoupling internal; supply voltage to stage 3 amplifier
15	VCC1	VCC Supply; 0.1µF decoupling internal; supply voltage to 1st stage amplifier
16	GND	Connect to low inductive path to ground

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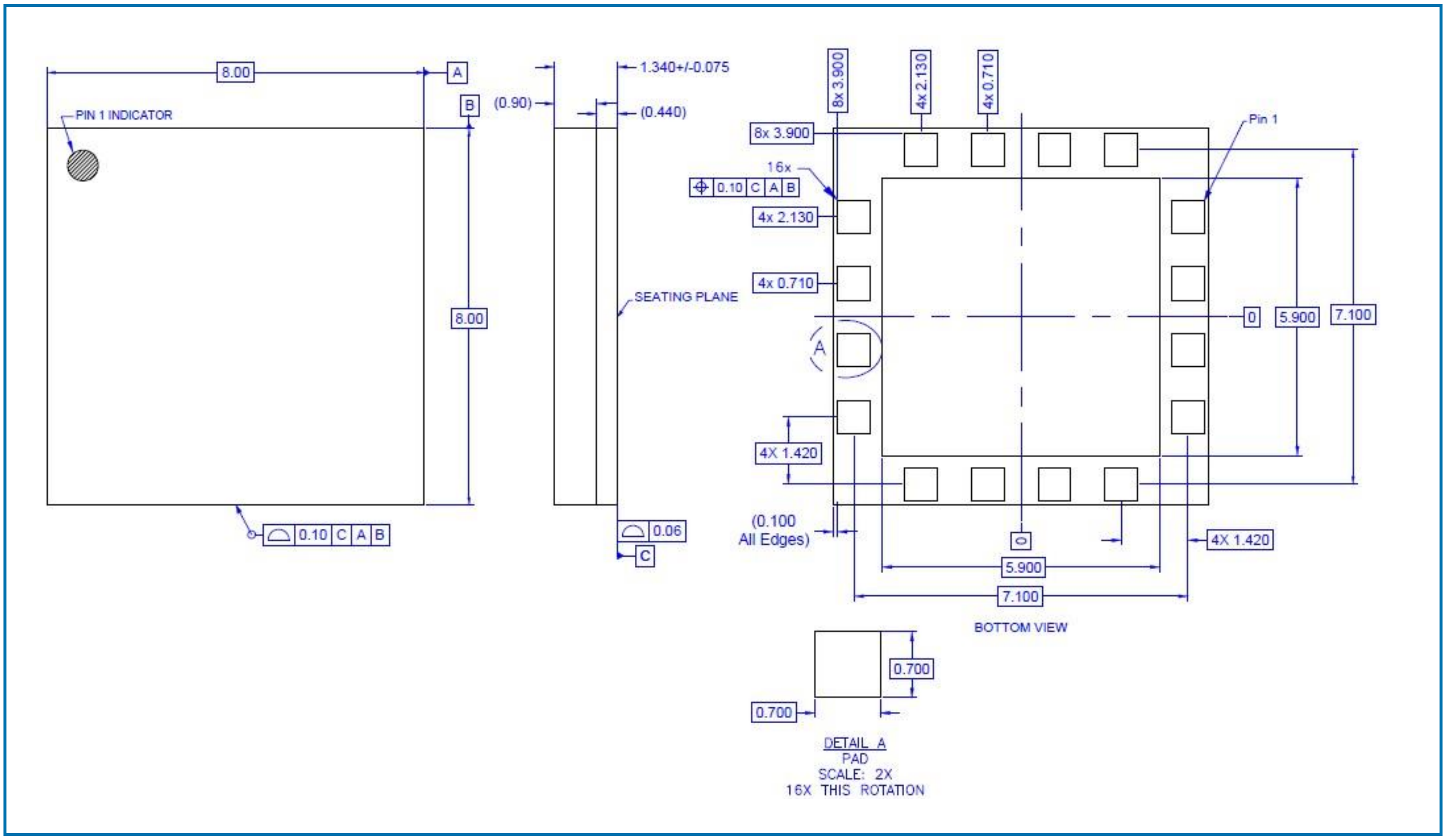
Package Outline Drawing (Dimensions in millimeters)



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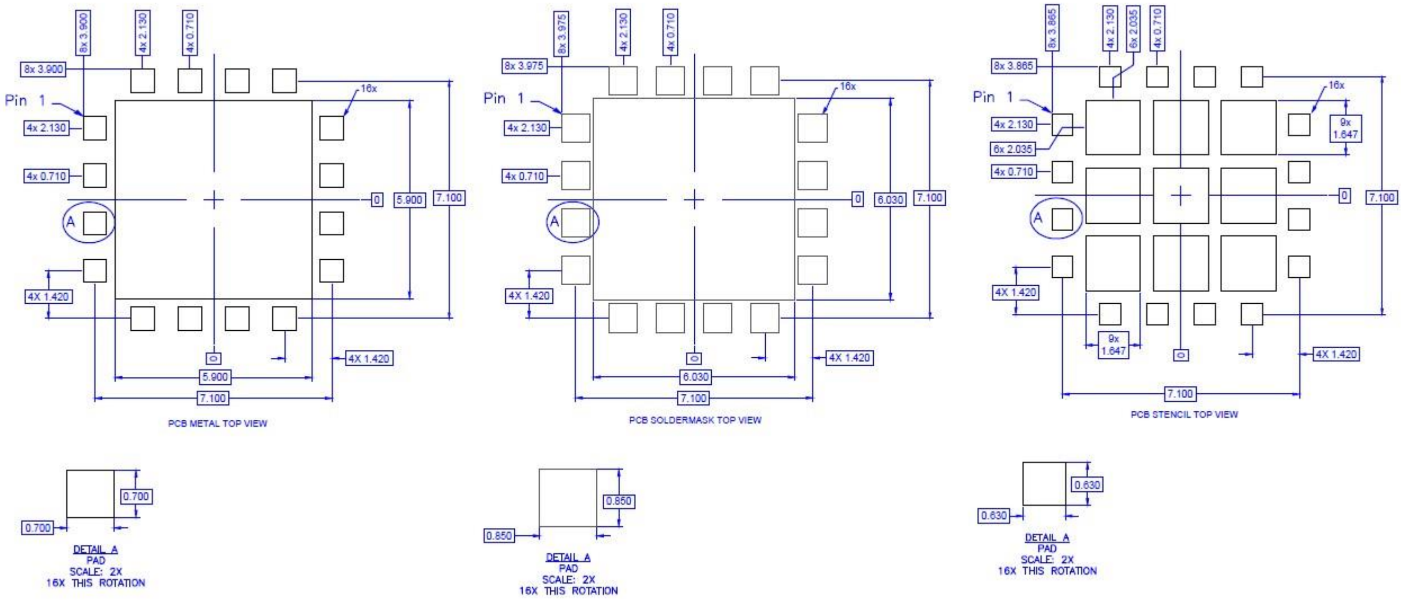
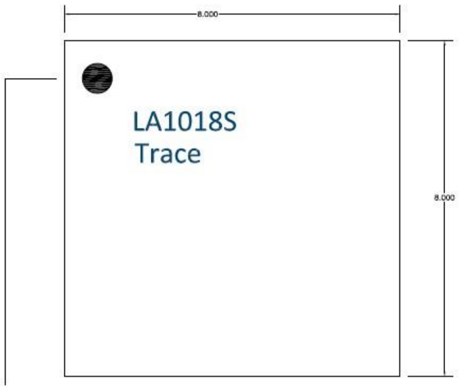
PCB Stencil Drawing (Dimensions in millimeters)



Branding Diagram



Pin 1 Indicator

Trace Code to be assigned by SubCon

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